Liquid Crystal Biosensors Functionalized with Protein Probe for Heavy Metal Ions Detection

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Liquid crystals (LCs) represent a unique state of matter that exhibits property of both liquid and a solid crystal at a certain temperature range. Their ability to respond to external stimuli makes them an eye-catching material for sensing and detection application. LCs have been extensively exploited as sensitive components in the development of LC biosensors that rely on the principle that specific bimolecular interactions can disrupt the orientational order of LC molecules. This disruption triggers a detectable change in the LC's optical properties, allowing them for the sensitive detection. The use of LC based biosensors have been considered as an encouraging and convenient approach for heavy metal ions in water sample. As HMs ions possess significant threat to both aquatic ecosystems as well as human wellbeing and are toxic even in a low concentration probably carcinogenic and can amass in biological system causing harm to multiple organs. This research work aims to provide an effective method for detection of heavy metal ions based upon its interaction with protein, that will act as a ligand which will be immobilized on glass surface coated with UV modified Dimethyloctadecyl [3(-trimethoxy silyl) Propyl] ammonium chloride) (DMOAP) providing surface for interaction with heavy metal ions. This interaction will lead to change in aligning behavior of LC which will serve as base for detection of metal ions. The characterization technique for this biosensor will be UV-VIS spectroscopy, scanning electron microscope (SEM) to study there, surface, morphology and textural properties. Further study will be done on polymerized Optical Microscope (POM). This innovative bio sensing technique holds a great application in environmental monitoring, Industrial Quality control, medical diagnostic and food safety offering a sensitive and selective mean of detection for heavy metal ions.